

## BROMELIADS OF THE STATE PARK OF VILA VELHA, PONTA GROSSA, PARANÁ, BRAZIL

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**ABSTRACT.** The State Park of Vila Velha is located 80 Km from west Curitiba in the Planalto Paranaense, a region know as Campos Gerais. The park, a conservation area for native vegetation, shelters many rare or endemic species. We studied the Bromeliaceae family to gather information on the phenology, growth habits, and ecological adaptations of species found at the Vila Velha State Park. Our study revealed 16 bromeliad species. These included nine *Tillandsia* species: *T. gardneri* Lindley, *T. geminiflora* Brong, *T. stricta* Solander, *T. tenuifolia* L. var. *tenuifolia*, *T. tenuifolia* var. *surinamensis* (Mez) L.B. Sm., *T. lorentziana* Grisebach, *T. crocata* (E. Morren) Baker, *T. streptocarpa* Baker, *T. recurvata* (L.) L., and *T. usneoides* (L.) L. We found three *Aechmea* species: *A. recurvata* (Klotzsch) L.B. Sm., *A. bromeliifolia* (Rudge) Baker, and *A. distichantha* Lem. Other species were *Dyckia tuberosa* (Vell.) Baker, *Vriesea friburgensis* Mez, *Billbergia nutans* H. Wendland ex Regel, and *Wittrockia cyathiforme* (Vell.) Leme.

**Key words:** Bromeliaceae, Paraná, Brazil

### INTRODUCTION

The State Park of Vila Velha is located 80 km from west Curitiba in the Planalto Paranaense, a region known as Campos Gerais (FIGURE 1). The park is a conservation area for native vegetation that includes rare and endemic species. Prominent among vegetation studies of Vila Velha State Park is that by Hatschbach and Moreira-Filho (1972), in which they mention 13 species of Bromeliaceae.

The State Park of Vila Velha is like a rock continent in a sea of vast rolling plants (Foster & Foster 1946, Foster 1993). Dry rocks support cacti, bromeliads, orchids, ferns, mosses, and lichens. Bromeliads are among the most common and characteristic species of the park. Species of *Tillandsia* prevail on rocky outcrops, which are a major attraction of the park (FIGURE 2). The landscape also includes forest fragments and fields where several species of Araceae, Orchidaceae, and Pteridophyta cohabit with such bromeliads as *Billbergia*, *Wittrockia*, *Aechmea*, and *Tillandsia* species. The forest fragments themselves are dominated by *Araucaria* forest, with the Paraná pine (*A. angustifolia*) being the most common species. The Paraná pine is associated with several species of the Lauraceae, Tiliaceae, and Euphorbiaceae (Veloso et al. 1991).

The taxonomy employed here of the 16 species follows Smith and Downs (1974, 1977, 1979) and Leme (1997).

### BROMELIACEAE OF VILA VELHA STATE PARK

#### Key to the Genera

1. Ovary superior or nearly so; fruit capsular, seed with appendage . . . . . 2
2. Plant terrestrial or saxicolous; leaves spinose; flowers orange-colored, ovary superior, seeds with winged appendage . . . . . *Dyckia*
2. Plant epiphytic or saxicolous; leaves entire, seeds with a plumose appendage . . . . . 3
3. Petals bearing 2 scales at base; sepals free or nearly so . . . . . *Vriesea*
3. Petals naked; sepals free or connate . . . . .  
. . . . . *Tillandsia*
1. Ovary inferior; fruit baccate, seeds naked . . . 4
4. Leaf-blades linear, sheath narrow, inflorescence simple, the scape decurved . . . . . *Billbergia*
4. Leaf-blades ligulate or narrowly triangular, sheath large; inflorescence simple or compound, erect or sunk in the leaves . . . . . 5
5. Inflorescence erect, exserted, compound, subcorymbose with bracts rose or purple . . . . .  
. . . . . *Wittrockia*
5. Inflorescence erect, exserted and compound or sunk, included in the leaves and simple . . . . . *Aechmea*

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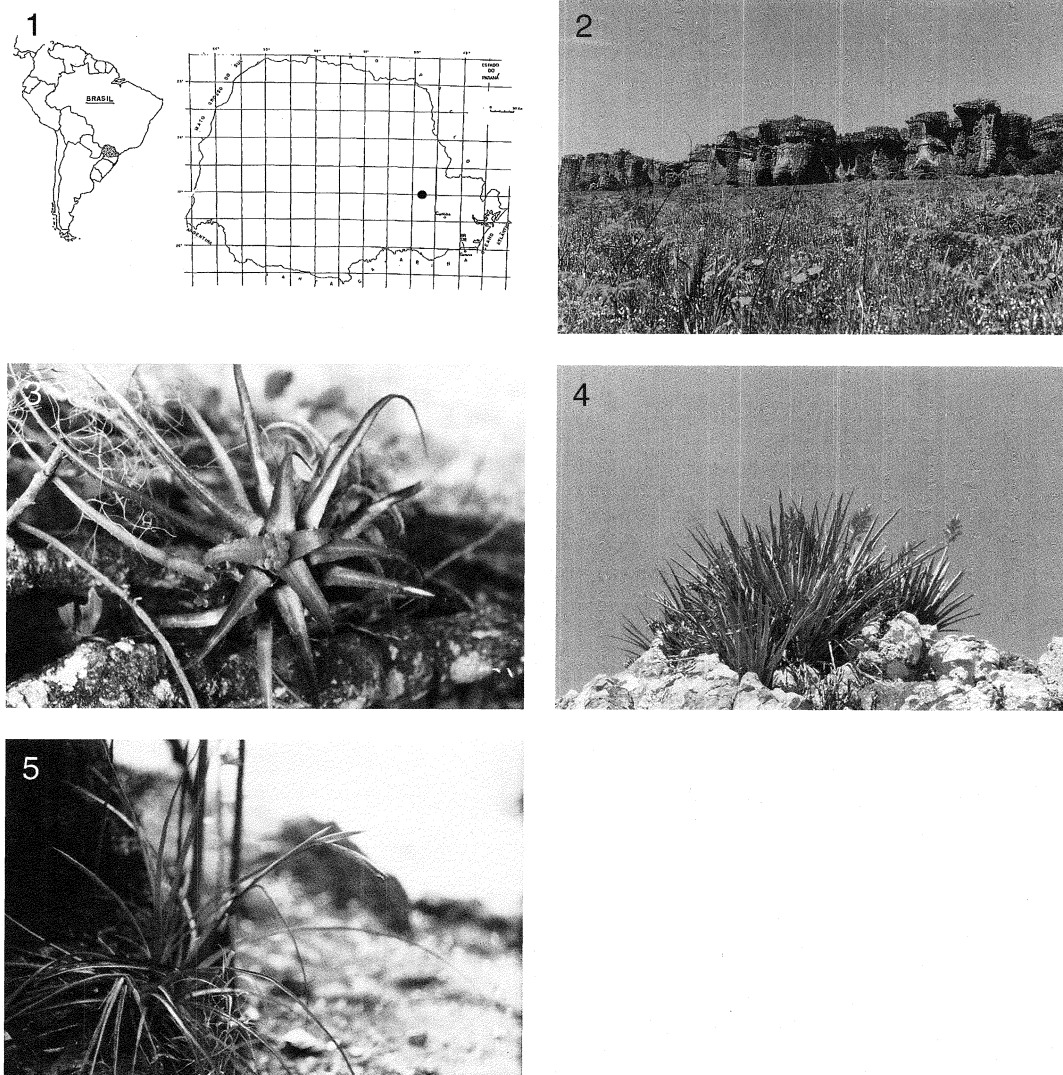


FIGURE 1. Location of the State Park of Vila Velha, Ponta Grossa, Paraná, Brazil.

FIGURES 2–5. 2. Landscape of the State Park of Vila Velha, noted for its rock outcroppings that resemble an old castle. 3. Flowering specimen of *Aechmea recurvata*. 4. Colony of *Aechmea distichantha*. 5. *Billbergia nutans*.

## *Aechmea*

### Key to the Species

1. Leaves narrowly triangular, recurved, inflorescence included . . . . . *A. recurvata*
1. leaves ligulate, erect, forming a tubular rosette; inflorescence exerted . . . . . 2
2. Inflorescence simple, densely white-lanate; petals greenish yellow . . . . . *A. bromeliifolia*
2. Inflorescence compound, bipinnate, petals purple or blue . . . . . *A. distichantha*

## *Aechmea recurvata* (Klotzsch) L.B. Sm.

FIGURE 3.

*Plant* epiphytic or saxicolous. *Leaves* in a dense rosette; blades narrowly triangular, abruptly spreading or recurving from the junction with the sheaths, green, serrate with curved spines; scape short, completely hidden by the leaf-sheaths. *Inflorescence* simple; floral bracts slightly exceeding the sepals, red. *Flowers* sessile, erect; sepals obtuse; petals erect, ligulate, obtuse, purple or rose, bearing 2 fimbriate scales

at base; stamens included; ovary triangular. *Fruit* baccate, globose, black.

Flowers August–April.

***Aechmea bromeliifolia* (Rudge) Baker**

*Plant* epiphytic or saxicolous, ca. 80 cm tall. *Leaves* in tubular rosette; blades ligulate, spinose, sheath ovate. *Scape* erect. *Inflorescence* simple, densely spicate, white-lanate with only the petals exposed at first; floral bracts shorter than the sepals, coriaceous; sepals connate at base, coriaceous; petals erect, oblong, greenish yellow, soon turning black, bearing 2 frimbriate scales at base; ovary tomentose. *Fruit* baccate.

Flowers September–April.

***Aechmea distichantha* Lem.**

FIGURE 4.

*Plant* epiphytic or saxicolous, 40–100 cm tall. *Leaves* in dense rosette or forming tubular rosette; blades spinose-serrate; sheath elliptic or oblong, vinous. *Scape* erect, white-flocculose. *Inflorescence* compound, bipinnate, dense or lax, rose and white-flocculose except the petals; spikes subsessile, erect to spreading, with 2–12 distichous flowers, the terminal with more and polystichously arranged flowers; floral bracts entire, apiculate or mucronulate, rose; sepals erect, connate at base, rose; petals obtuse, purple or blue, bearing 2 oblong serrate scales at base; stamens included; filaments and anthers white; ovary rose. *Fruit* baccate, white.

Flowers August–April.

**Billbergia**

***Billbergia nutans* H. Wendland ex Regel**

FIGURE 5.

*Plant* epiphytic or saxicolous, 30–40 cm tall. *Leaves* 30–70 cm long; blades linear or narrowly triangular, serrate with slender spines or sometimes entire; sheaths narrow. *Inflorescence* simple; scape decurved, slender; scape bracts ovate-lanceolate, rose; floral bracts ca. 2 mm long. *Flowers* 4–5 cm long; sepals free, linear, acute, rose; petals free, pale green with dark blue margins bearing 2 large serrate scales at base; stamens exserted, filaments slender, anthers yellow; ovary greenish, style longer than the stamens. *Fruit* baccate, globose with persistent sepals.

Flowers May–July.

**Dyckia**

***Dyckia tuberosa* (Vell.) Beer**

FIGURE 6.

*Plant* terrestrial, 40–100 cm tall, stem tuberous. *Leaves* spinulose. *Inflorescence* simple or compound, ca. 25 flowers. *Scape* erect, ca. 20 cm long. *Floral bracts* reddish. *Flowers* ca. 20

mm long; sepals orange-colored, ca. 7 mm long, acute or obtuse; petals orange-colored, ca. 12 mm long, obtuse; stamens included, ovary long. *Flowers* September–January.

**Tillandsia**

**Key to the Subgenera and Species**

1. Style slender, long, filaments strongly plicate near apex ..... 2 (subgenus *Anoplophytum*)
2. Plant flowering ca. 60 cm tall, saxicolous, petals white ..... *T. lorentziana*
2. Plant flowering 10–25 cm tall, epiphytic or saxicolous; petals rose or blue ..... 3
3. Flowers with sepals and petals rose .... 4
3. Flowers with sepals rose and petals blue or purple ..... 5
4. Leaf-blades covered with spreading cinereous scales; scape ca. 12 cm long, floral bracts ovate, acuminate ... *T. gardneri*
4. Leaf-blades green or reddish, scape ca. 15 cm long, floral bracts oblong, acute .... *T. geminiflora*
5. Leaf-blades narrowly triangular, floral bracts elliptic, long-caudate; sepals equally connate at base ... *T. stricta*
5. Leaf-blades very narrow, nearly linear, slender or secund, floral bracts elliptic, short-caudate; sepals very connate posteriorly ..... 6
6. Inflorescence shorter than the slender leaves; leaves scarcely or not at all secund ..... *T. tenuifolia* var. *tenuifolia*
6. Inflorescence exceeding the stout, usually secund leaves ..... *T. tenuifolia* var. *surinamensis*
1. Style short and stout; filaments not plicate .... 7
7. Petal blades broad, showy ..... 8 (subgenus *Phytarriza*)
8. Plant flowering 15–35 cm tall, saxicolous, distichous, inflorescence simple, flowers distichous, petals yellow ..... *T. crocata*
8. Plant flowering 40–50 cm tall, saxicolous or epiphytic, leaves spirally arranged along the stem, blades recurved, inflorescence with bipinnate, from 2–12 spikes or rarely simple; petals purple or blue ..... *T. streptocarpa*
7. Petal blades narrow, inconspicuous ..... 9 (subgenus *Diaphoranthema*)
9. Plant epiphytic, roots present, scape erect, inflorescence with 1–5 flowers, petals blue or purple ..... *T. recurvata*
9. Plant epiphytic, pendent, root absent, scape absent, inflorescence reduced to a single flower, petals green ..... *T. usneoides*

***Tillandsia crocata* (E. Morren) Baker**

FIGURE 7.

*Plant* saxicolous, xeric, ca. 15–40 cm tall. *Leaves* distichous, densely tomentose-lepidote; blades narrow triangular, reflexed; sheaths ovate. *Inflorescence* simple with 2–6 distichous flow-

ers; scape erect, slender, tomentose like leaves; floral bracts ovate, about equaling sepals. *Flowers* fragrant; sepals lanceolate, asymmetrical, connate at base; petals with blades obtuse, bright yellow; stamens included, exceeding style; ovary elliptic. *Fruit* capsular, cylindric.

Flowers October–April.

***Tillandsia gardneri* Lindley**

Plant epiphytic or saxicolous, ca. 15–20 cm tall. *Leaves* in rosette; blades soft, densely lepidote with spreading trichomes, recurved; sheath indistinct. *Inflorescence* elliptic or almost globose, with 12 spikes, with 2 or 3 distichous flowers; scape ca. 12 cm long; floral bracts not exceeding sepals, oval, acute, carinate; sepals sub-oval, acute or obtuse, posterior ones connate, rose; petals linear, rose; stamens included, filaments plicate; ovary ovoid. *Fruit* capsular triangular in outline.

Flowers September–December

***Tillandsia geminiflora* Brong. FIGURE 8.**

Plant epiphytic, ca. 18–20 cm tall. *Leaves* forming a broad rosette, blades green or reddish. *Inflorescence* globose or almost pyramidal, polystichous, with ca. 14 spikes with 2 or 3 flowers; scape ca. 15 cm long, pendent. *Flowers* rose; floral bracts longer than sepals, oblong, acute; sepals rose, posterior pair connate for 2–3 mm; petals rose, ligulate with rounded and spreading tips; stamens included, filaments plicate; ovary oval. *Fruit* capsular, cylindric.

Flowers September–December.

***Tillandsia lorentziana* Griseb. FIGURE 9.**

Plant epiphytic or saxicolous, xeric, ca. 60 cm tall. *Leaves* polystichous along the stem; blades narrowly triangular, long attenuate, the inner erect, outer reflexed, covered with spreading cinereous or brownish scales, sheaths flat. *Inflorescence* simple or bipinnate with 4–8 spikes; scape erect with scape-bracts imbricate. *Flowers* short-pedicellate; floral bracts reddish, erect; sepals reddish, short-connate, oblong, acute; petals white, the blades erect, elliptic; stamens included, filaments plicate. *Fruit* capsular.

Flowers December–May.

***Tillandsia recurvata* (L.) L.**

Plant epiphytic, stem typically much shorter than leaves but occasionally equaling them; root present. *Leaves* distichous, densely tomentose-lepidote; blades linear, recurved, the inner erect, linear; sheaths thin. *Inflorescence* simple with 1–5 flowers; scape erect, rachis densely lepidote; floral bracts shorter or equaling sepals, densely lepidote. *Flowers* erect, short-pedicellate; sepals lanceolate, acuminate, posterior ones connate;

petal blades narrow, violet or blue; stamens included; style short and stout. *Fruit* capsular, cylindric.

Flowers October–January.

***Tillandsia streptocarpa* Baker FIGURE 10.**

Plant saxicolous or epiphytic, xeric, ca. 50 cm tall. *Leaves* polystichous along stem, the outer recurved; blades linear-triangular, long-attenuate, densely tomentose-lepidote; sheaths ovate, imbricate along stem. *Inflorescence* often bipinnate from 2 to many spikes or rarely simple; scape slender, erect, glabrous. *Flowers* erect, fragrant; floral bracts lanceolate, acute, slightly shorter than sepals, glabrous or lepidote; sepals free or connate, oblong; petals violet or blue, the blades broad, ovate, showy; stamens included, exceeding style. *Fruit* capsular, cylindric.

Flowers January–May.

***Tillandsia stricta* Solander**

Plant epiphytic or saxicolous, 10–20 cm tall. *Leaves* forming a broad rosette; blades triangular, recurved; sheaths indistinct. *Inflorescence* simple, polystichous, rarely distichous; scape slender, pendent. *Flowers* erect, sessile; floral bracts elliptic, long-caudate, rose; sepals equally connate at base, rose; petals oval, blue or purple, rounded at tips; stamens enclosed, filaments linear, plicate; ovary oval. *Fruit* capsular, cylindric.

Flowers August–February.

***Tillandsia tenuifolia* L.**

Plant epiphytic or saxicolous, very variable. *Leaves* polystichous along stem; leaves narrow-triangular or linear, slender, secund or not; sheath thin. *Inflorescence* simple, polystichous; scape erect or pendent; floral bracts elliptic, short-caudate, rose; sepals lanceolate, rose, posterior ones connate; petals oblong, white, blue or purple; stamens included, filaments plicate. *Fruit* capsular, cylindric.

Flowers August–April.

***T. tenuifolia* L. var. *tenuifolia***

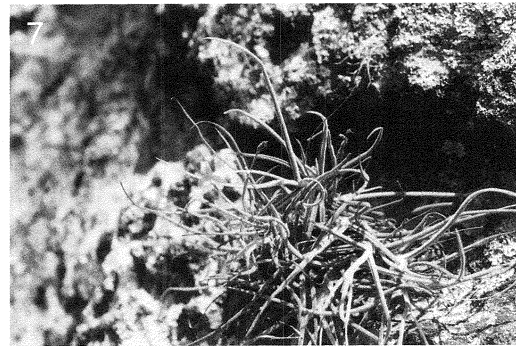
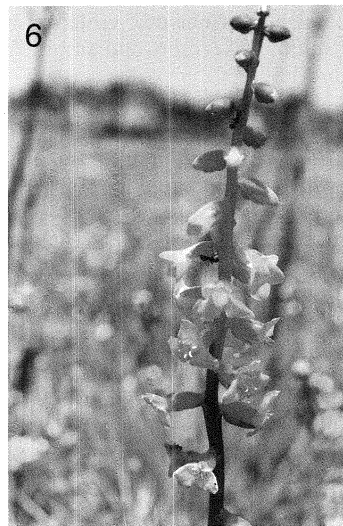
*Leaves* slender, scarcely if at all secund; blades flat near the base. *Inflorescence* exceeded by the leaves. *Flowers* polystichous.

***T. tenuifolia* L. var. *surinamensis* (Mez) L.B. Sm.**

*Leaves* stout, usually secund. *Inflorescence* exceeding the leaves. *Flowers* polystichous.

***Tillandsia usneoides* (L.) L.**

Plant epiphytic and pendent; roots absent; stem sympodial; leaves distichous, 3–5 cm long, densely tomentose-lepidote; blades filiform, ca. 1 mm in diameter; sheaths elliptic, involute.



FIGURES 6–11. 6. *Dyckia tuberosa* inflorescence. 7. *Tillandsia crocata*. 8. *Tillandsia geminiflora*. 9. *Tillandsia lorentziana*. 10. *Tillandsia streptocarpa*. 11. *Wittrockia cyathiformis*.

Flower terminal, single; floral bracts ca. 5 mm long, densely lepidote, shorter than sepals; petals narrow, acute or obtuse, pale green or yellowish; stamens included, exceeding the style. Fruit capsular, cylindric.

Flowers November–April.

### Vriesea

#### *Vriesea friburgensis* Mez

Plant saxicolous or epiphytic, ca. 2 m tall. Leaves ca. 20 in a dense rosette; blades ligulate; sheath elliptic. Inflorescence compound; scape

erect, bracts reddish. *Flowers* ca. 5 cm long, yellow; sepals elliptic, obtuse; petals linear, bearing 2 entire and obtuse scales; stamens exserted. *Fruit* capsular.

Flowers December–March.

### Wittrockia

*Wittrockia cyathiformis* (Vell.) Leme

FIGURE 11.

*Plant* epiphytic, saxicolous or terrestrial, ca. 50–75 cm tall. *Leaves* in dense rosette; blades ligulate, suberect, densely serrate with dark spines at base; sheaths large, elliptic or oblong. *Scape* erect, 27–50 cm long, rose or red. *Inflorescence* subcorymbose; scape bracts rose or red; floral bracts linear, acuminate. *Flowers* sessile; sepals free, narrowly triangular, acuminate, white-greenish; petals free, lanceolate, yellow, orange-yellow toward apex bearing 2 frimbriate scales at base; stamens included; ovary subcylindric. *Fruit* baccate with persistent sepals.

Flowers November–March.

### DISCUSSION

A study of the family Bromeliaceae of the State Park of Vila Velha revealed the occurrence of 16 species (including two varieties of *Tillandsia tenuifolia*). *Tillandsia* is the largest genus, with nine species, followed by *Aechmea*, with three. The other genera (*Dyckia*, *Vriesea*, *Billbergia*, and *Wittrockia*) are represented by only one species each.

Some of these species can be considered characteristic of the Vila Velha State Park, because they mainly inhabit the perpendicular rocks of the Campos Gerais. This area presents ideal conditions for the growth of many xeric species, especially *Tillandsia*. Xeric bromeliads survive with minimal amounts of water and tolerate maximum sun radiation (Rousse 1997). Xeric bromeliads can be terrestrial, epiphytic, or saxicolous. *Tillandsia lorentziana*, *T. streptocarpa*, and *T. crocata* are the predominant xeric bromeliads on the perpendicular rocks of the park. None of these species are found in the more humid ecosystems nearby, such as the Atlantic forest or Araucaria forest.

*Tillandsia lorentziana*, the most abundant species of this genus in the park, can be confused in its vegetative state with *T. streptocarpa*. Both species cohabit the same perpendicular rocks and present common characteristics, such as silvery 50–60 cm tall plants with reflexed outer leaves. *Tillandsia crocata*, a less abundant species, usually is found on isolated perpendicular rocks, where it forms large populations.

The remaining *Tillandsia* species (*T. geminiflora*, *T. gardneri*, *T. stricta*, *T. tenuifolia*, *T. recurvata*, and *T. usneoides*) are epiphytes or occasionally saxicolous. These delicate species are very common in the park.

*Tillandsia gardneri* and *T. geminiflora* are closely related, with many vegetative and floral characteristics in common. They can be distinguished, however, using characters of density and color of trichomes on the leaf surface, length of the floral scape, inflorescence, floral bract, and pollen grains. In addition, *T. geminiflora* is an exclusively epiphytic plant, living only on trees; unlike *T. gardneri*, which lives both on trees and rocks.

*Tillandsia stricta* is extremely abundant in the park. It is an epiphytic species that lives in open areas of the forest and often covers entire tree branches.

*Tillandsia tenuifolia* displays variable morphology. When epiphytic, this species has a short stem and fine leaves, disposed in a rosette; at other times, however, it may have a long stem, ca. 25 cm in length and leaves that are polystichous along the stem. When on rocks, *T. tenuifolia* is smaller, 8–10 cm tall, with coriaceous, secund leaves. The inflorescence may have distichous or polystichous flowers, and its petals may be blue or white, another common variation of this species that makes recognition difficult.

*Tillandsia recurvata* has a broad distribution. This may be related to a high seed germination rate. It produces large masses of plants that often completely cover tree branches.

*Tillandsia usneoides*, commonly called Spanish moss, is found in shaded, airy places, hanging from trees.

*Aechmea* species occur as epiphytes or are on rocks. *Aechmea recurvata* and *A. bromeliifolia* are not abundant in the park. During the flowering season, however, *A. recurvata* is very attractive, as most of its leaves turn red in color. With its fleshy leaves and dense compact rosettes, *Aechmea distichantha* is the most representative and attractive species of the genus in the park, forming large colonies on the rocks.

Other bromeliad species occur in small colonies, such as *Vriesea friburgensis*, which is a conspicuous, attractive plant. It may be epiphytic or saxicolous in several places in the park. In contrast, *Billbergia nutans* inhabits only shaded, humid rocks where it forms large colonies; and *Dyckia tuberosa* forms large colonies among rocks and in soil.

*Wittrockia cyathiformis* is a terrestrial or saxicolous plant whose leaves have enlarged sheaths that impound large amounts of water. Elsewhere in the state of Paraná, *W. cyathiformis*, *Vriesea friburgensis*, and *Billbergia nutans*

occur in other types of ecosystems, such as the Atlantic forest and Araucaria forest (Tardivo & Cervi 1997).

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